

# Processing Synoptic Measurement Data

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# Why are we looking at Processing Synoptic Data

- No “Master” list of synoptic data.
  - Several different lists.
- No official synoptic measurement dates.
- No information about how existing figures were created.
- No information about decisions that went into previous synoptic data processing.

# Goals for Synoptic Data Processing

- Create a central location for all synoptic data
- Process and display all synoptic data in a consistent manner
- Institute enough documentation and transparency to ensure repeatability across users and across time

# The Process

 WELL\_LOG: EASTERN SNAKE PLAIN AQUIFER MODEL AREA (Generic Filter) 

Township 01N18E ▲ 01N21E 01N22E 01N23E 01N24E 01N25F ▼	Section All						1/4-1/4 All			
	06	05	04	03	02	01	B	A	B	A
	07	08	09	10	11	12	C	D	C	D
	18	17	16	15	14	13	B	A	B	A
	19	20	21	22	23	24	C	D	C	D
	30	29	28	27	26	25				
	31	32	33	34	35	36				

Lithologic Log? ☒ All ☐ Yes ☐ No

Interval: 0 to TD  
Depth Elev

Lithology: Any All  
Hardpan/Caliche  
Soil  
Clay

Completion Date: \_\_\_\_/\_\_\_\_/\_\_\_\_ - \_\_\_\_/\_\_\_\_/\_\_\_\_

Well Test: All Bailer  
Pump Other  
Air

LSD Elevation: \_\_\_\_ to \_\_\_\_

Well Openings: \_\_\_\_ to \_\_\_\_

Total Depth: \_\_\_\_ to \_\_\_\_

Penetration Depth: \_\_\_\_ to \_\_\_\_

WL Date Period: 10/01/2008 to 12/01/2008

WL Depth Range: \_\_\_\_ to \_\_\_\_ WLS => 1

WL Status: All  
Pumping  
Recently Pumped  
Nearby, Pumping  
Flowing  
Recently Flowed  
Nearby, Flowing  
Foreign Substance  
Discontinued  
Obstruction  
Dry  
Other

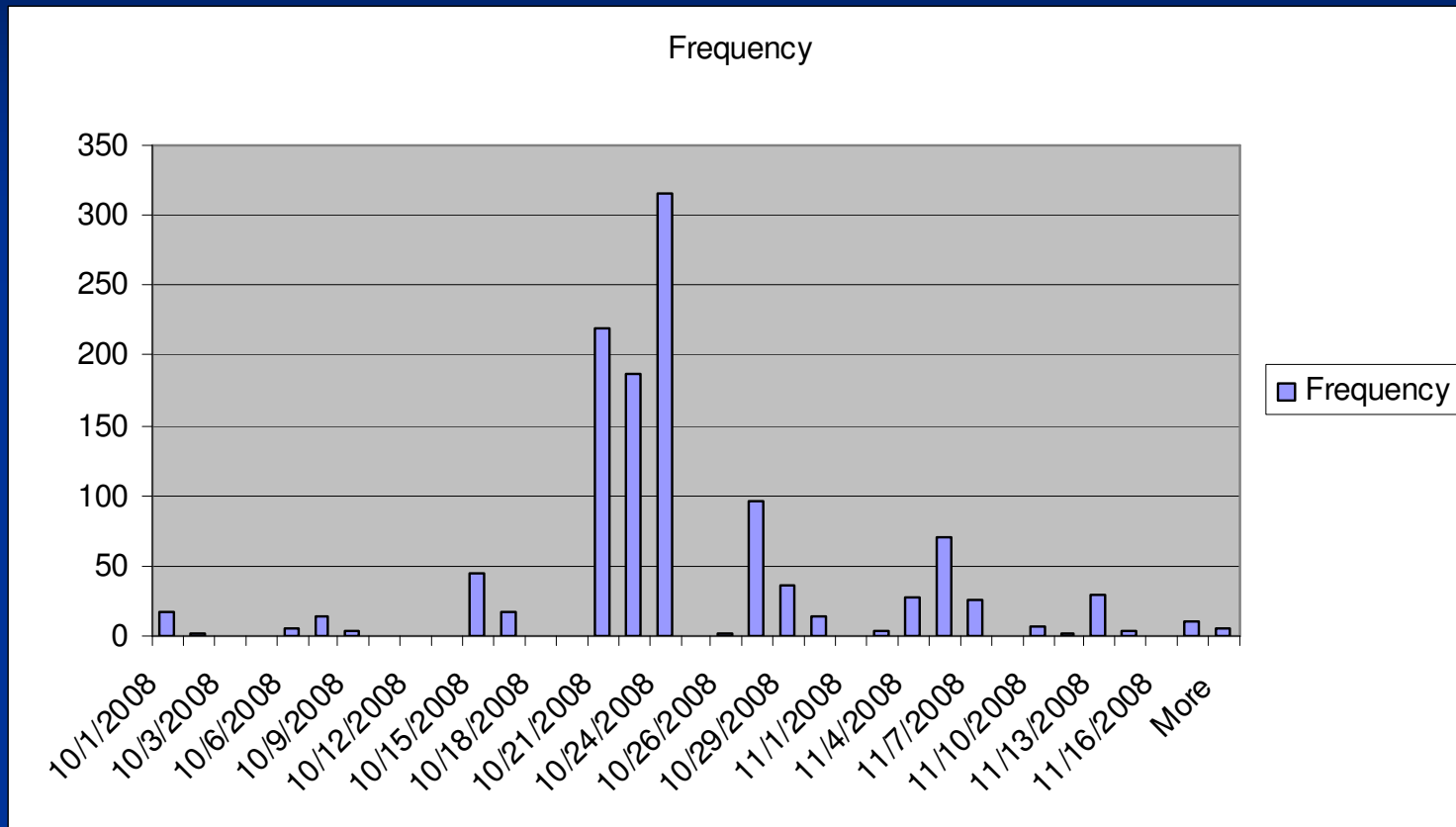
WL Agency: All  
IDWR  
USGS  
DEQ  
AGRI  
Govt  
WMD  
Consultant  
School  
Driller  
Owner  
Other

Water Use: All Injection  
Domestic Mining  
Industrial A/C  
Commercial Municipal  
Institution Fire  
Irrigation Power  
Stock Recreation  
Aquaculture Unused  
Heating Other  
Test

Method Drilled: All  
Air Rotary Augered  
Cable Tool Reverse  
Driven Jetted  
Hydraulic Other  
Dug

1. Query a larger date-range than is expected for the synoptic even.

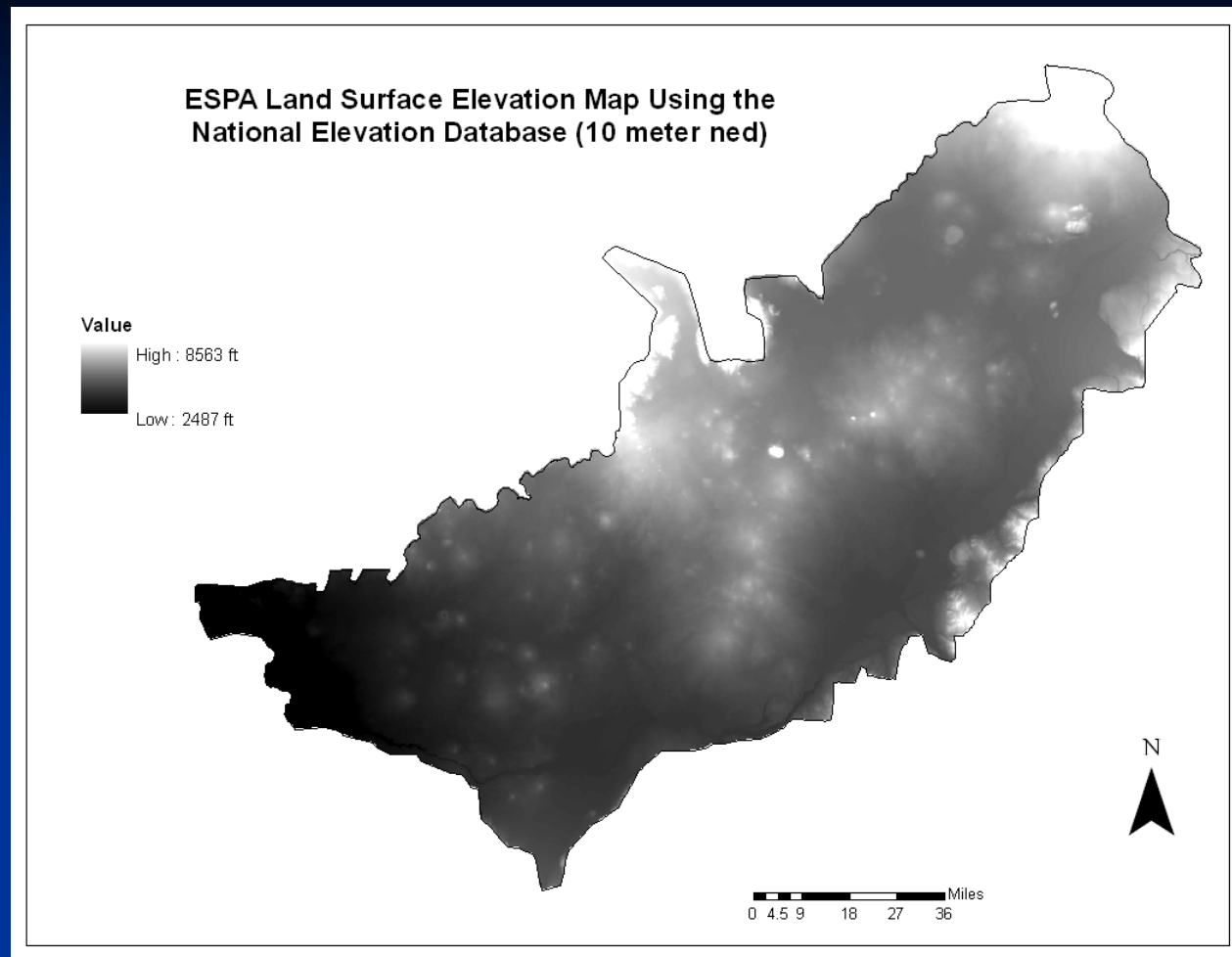
# The Process



2. Plot a histogram and find the intended synoptic event.
  2. I chose 10/1/2008 – 11/17/2008

# The Process

3. Plot selected wells in GIS and get well elevations using the 10-meter National Elevation Database (ned).
  - Gives much better elevations than what is in the database.
    - Assumes wells are properly located.
    - I have checked all wells with elevation differences of  $\geq 20$  ft. ALL have better elevation estimates than the database.



“The 95% confidence interval for the well elevation estimate is 1.21 ft above the surveyed elevation +1.17 ft, much more accurate than the IDWR estimated accuracy of +11 ft using topographic maps.”

- Wylie, 2004

# The Process

4. Create preliminary contour map and check for anomalous water levels (perched or sinks).
4. A threshold of 50 ft difference from surrounding wells as criteria for selecting anomalies.
  - a) Check against previous events to ensure all perched have been removed.



# The Process

5. Create final contour maps.
6. Finalize data worksheets.
7. Finalize Metadata

# Deliverables

- Workbooks for each synoptic event.
- Single workbook of “official” synoptic data for all events.
  - One location if no further analyses is required.
  - Common location for change maps and data.
- Contour and Change Maps.
- Shape files of wells and maps.
  - Metadata will describe data properties and processing.

# Synoptic Data Files

\ SP\_08\_KEY / SP08\_DATE\_CHOICE / SP08\_ALL\_DATA / SP08\_DATA\_USE /

/ SP08\_LOG / SP08\_ELEV / SP08\_NO\_PERCH / SP08\_PERCH / SP\_08\_MAP /

- Individual workbook for each year to track the process. This will enable other users to re-create the same contour maps and will allow flexibility in using the data.

This data set was created by Mike McVay, IDWR - Fall 2009.

The intention is to:

1. Create a central location for all synoptic data.
2. Process and display all synoptic data in a consistent manner.
3. Input enough documentation and transparency for repeatability across users and across time.

#### **SP\_08\_ALL\_DATA**

This data set includes all data within the queried time period. This set includes wells without database information (location, construction, etc.), wells outside of the ESPA boundary and perched wells.

#### **SP\_08\_DATA\_USE**

This is the full data set minus three (3) duplicate wells, minus seven (7) wells with no supporting data, minus one (1) well with no location information.

#### **SP\_08\_DATE\_CHOICE**

This sheet is used to choose the query time-frame. The Spring 2008 event data set that encompasses 03/10/2001- 04/30/2001.

#### **SP\_08\_ELEV**

This sheet shows the results of the ned elevation process. The sample locations were used to "Export values to points" in GIS using the National Elevation Data set (10 m dem).

#### **SP\_08\_LOG**

This sheet contains the "well\_log" database information for all wells in the SP\_08\_DATA\_USE worksheet.  
This sheet is ready for import into ArcMAP GIS.

#### **SP\_08\_USABLE\_LOG**

This sheet contains the "well\_log" database information for all wells in the SP\_08\_ELEV worksheet.  
This sheet excludes wells outside of the ESPA boundary.  
This sheet is ready for import into ArcMAP GIS.

#### **SP\_08\_NO\_PERCH**

This sheet contains the "well\_log" database information for all wells in the SP\_08\_USABLE\_LOG worksheet, minus any anomalous wells (perched/sunk)  
This sheet excludes wells outside of the ESPA boundary. This sheet excludes wells  $\geq 50$  ft +/- the regional water table.  
This sheet is ready for import into ArcMAP GIS.  
This Sheet serves as the OFFICIAL DATA SET USED TO CREATE CONTOUR MAPS

#### **SP\_08\_PERCH**

This sheet contains the "well\_log" database information for all wells classified as "perched".  
This sheet excludes wells outside of the ESPA boundary. This sheet includes wells  $\geq 50$  ft +/- the regional water table.  
This sheet is ready for import into ArcMAP GIS.

#### **MAPS**

This sheet contains .gif maps of the synoptic data.

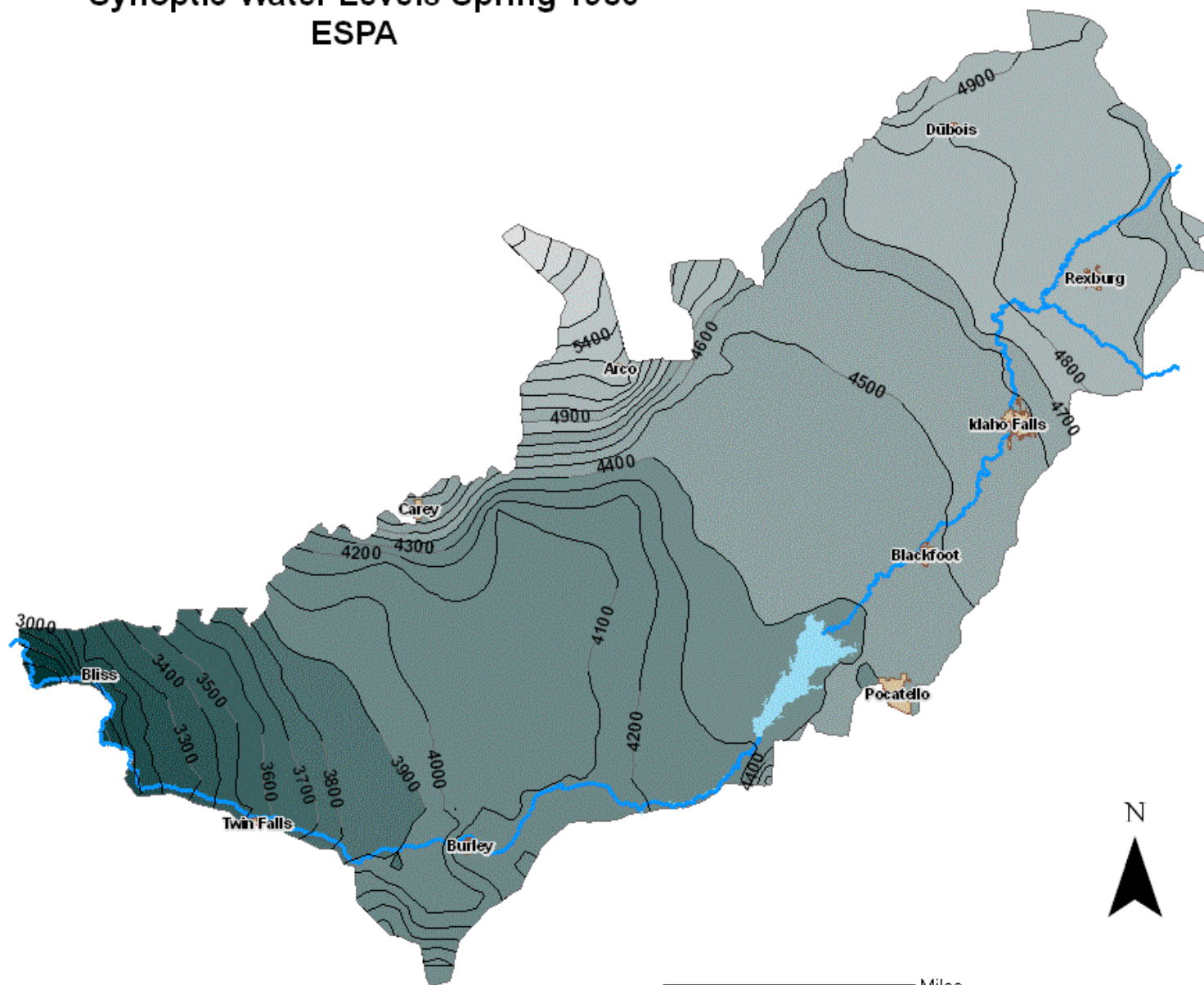
**Each worksheet captures a step in the process allowing enough transparency to understand previous decisions. This framework also preserves enough data so alternate analyses can be performed without losing the original data.**

Let's look at some

# Contour Maps

## Synoptic Water Levels Spring 1980 ESPA

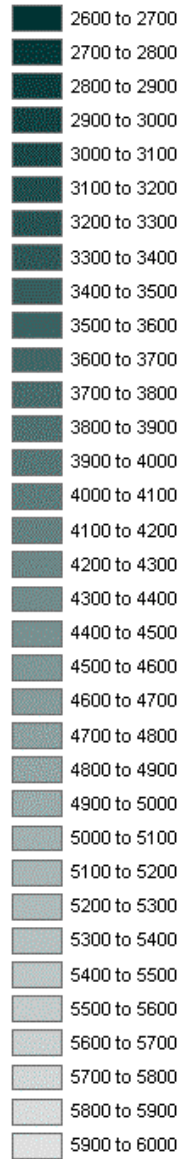
Elevation (ft amsl)



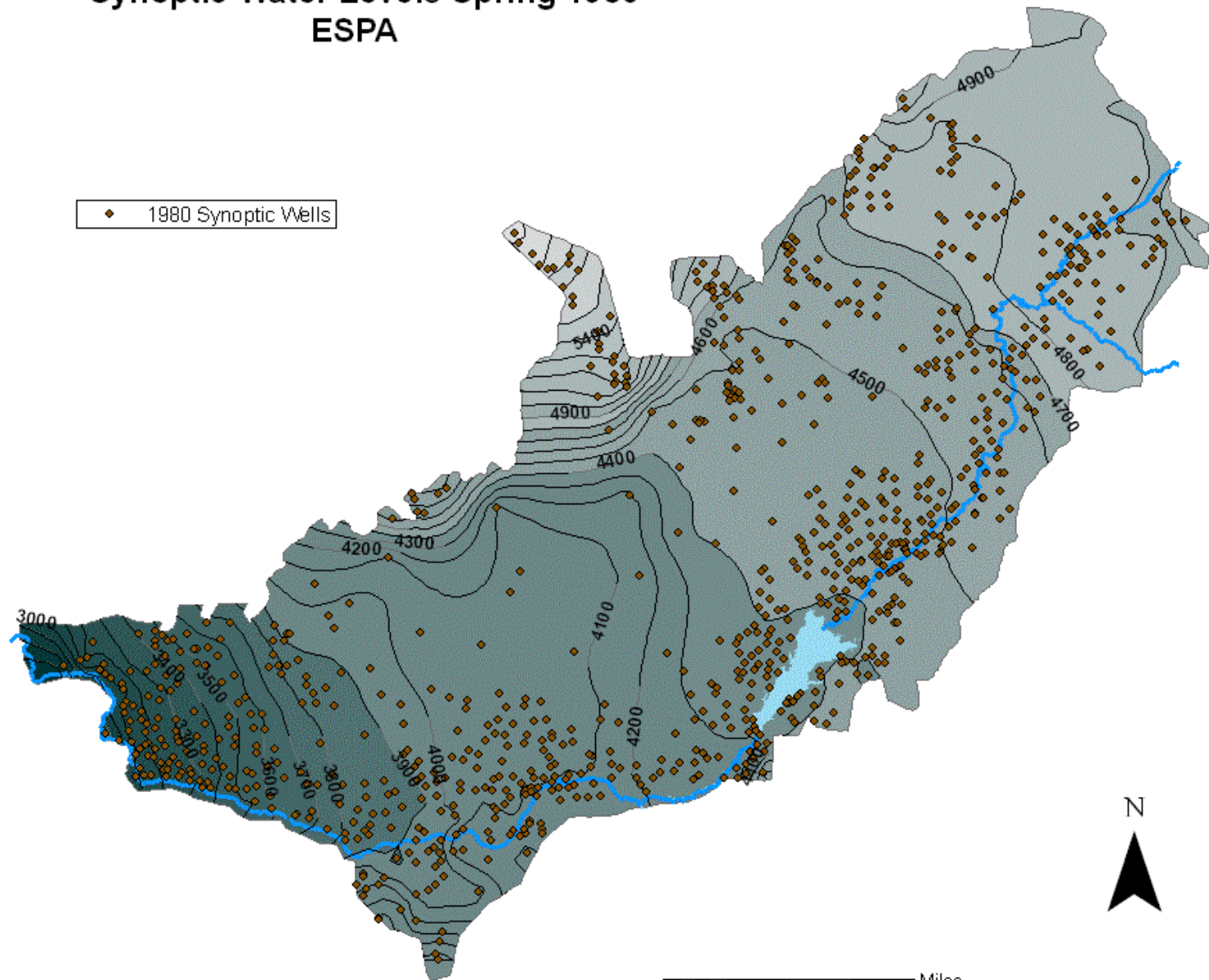


## Synoptic Water Levels Spring 1980 ESPA

Elevation (ft amsl)



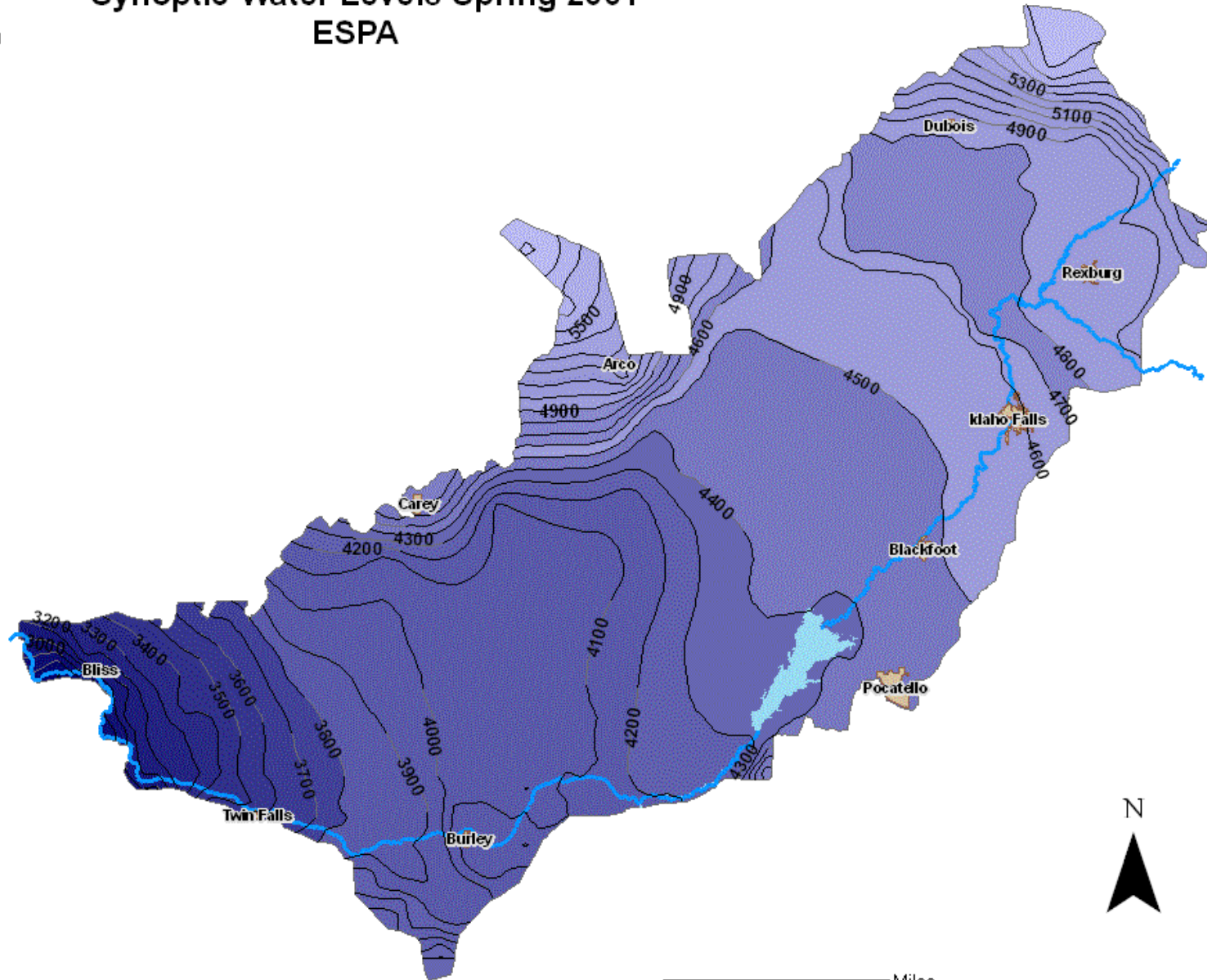
1980 Synoptic Wells



0 5 10 20 30 40 Miles

## Synoptic Water Levels Spring 2001 ESPA

Elevation (ft amsl)



0 4.5 9 18 27 36 Miles

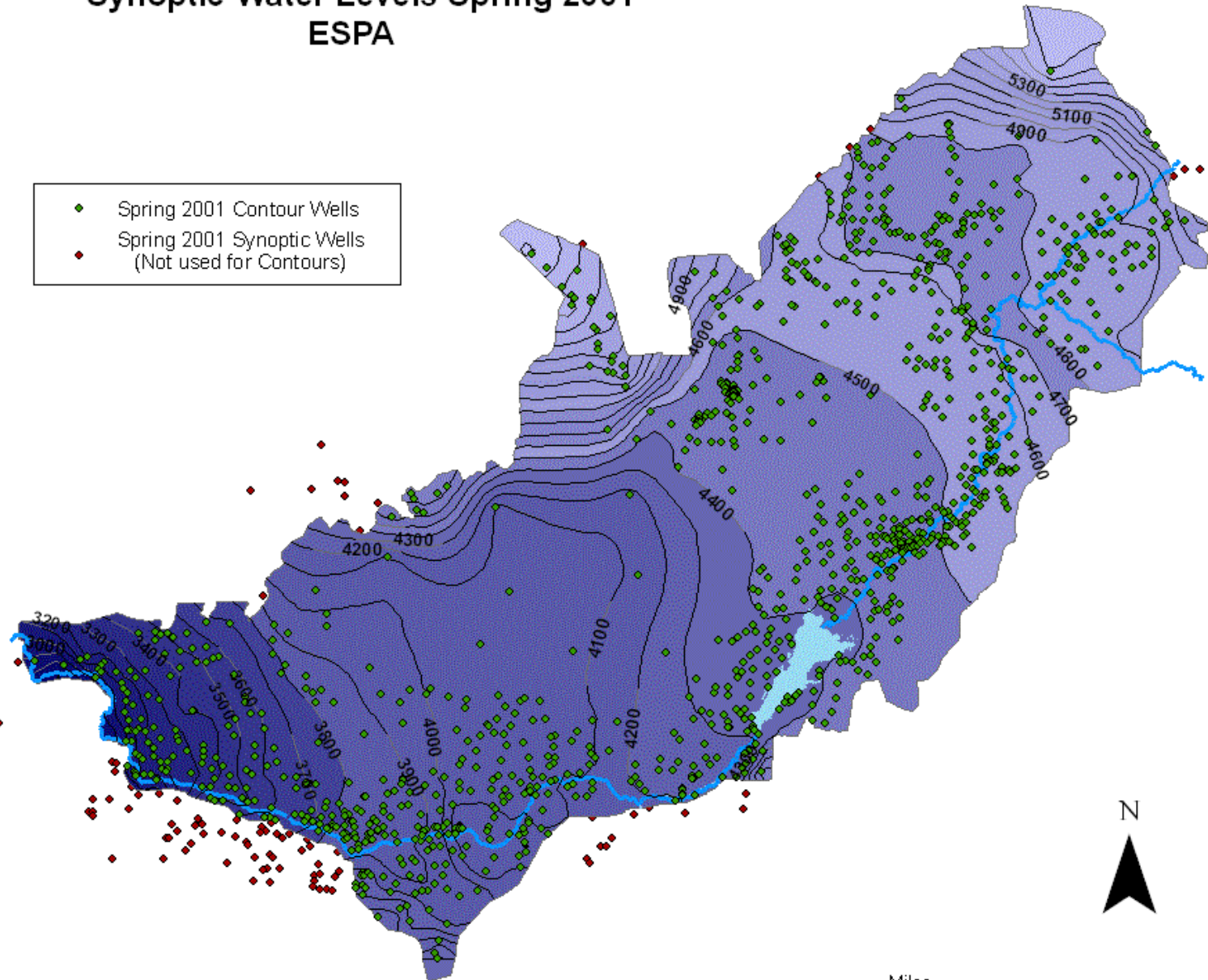


# Synoptic Water Levels Spring 2001 ESPA

Elevation (ft amsl)



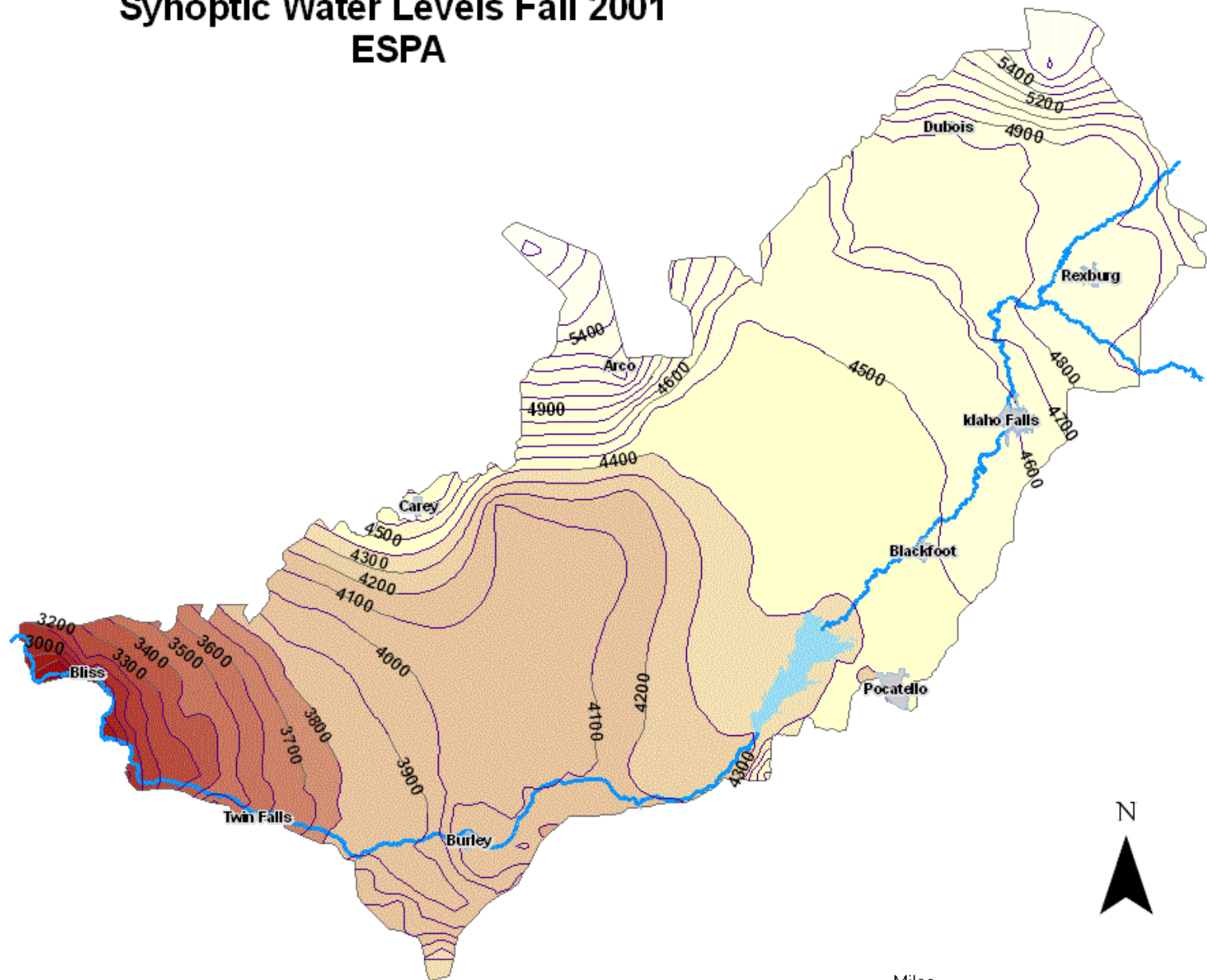
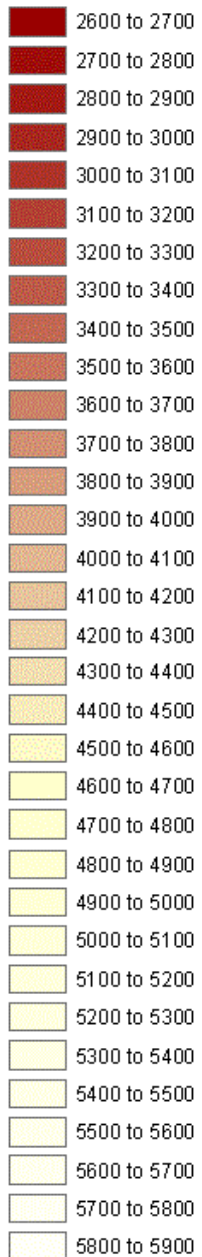
- Spring 2001 Contour Wells
- Spring 2001 Synoptic Wells  
(Not used for Contours)



0 4.5 9 18 27 36 Miles

## Synoptic Water Levels Fall 2001 ESPA

Elevation (ft amsl)

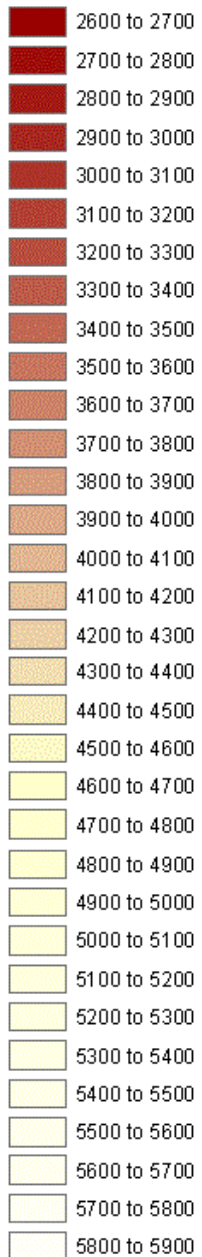


0 4.5 9 18 27 36 Miles

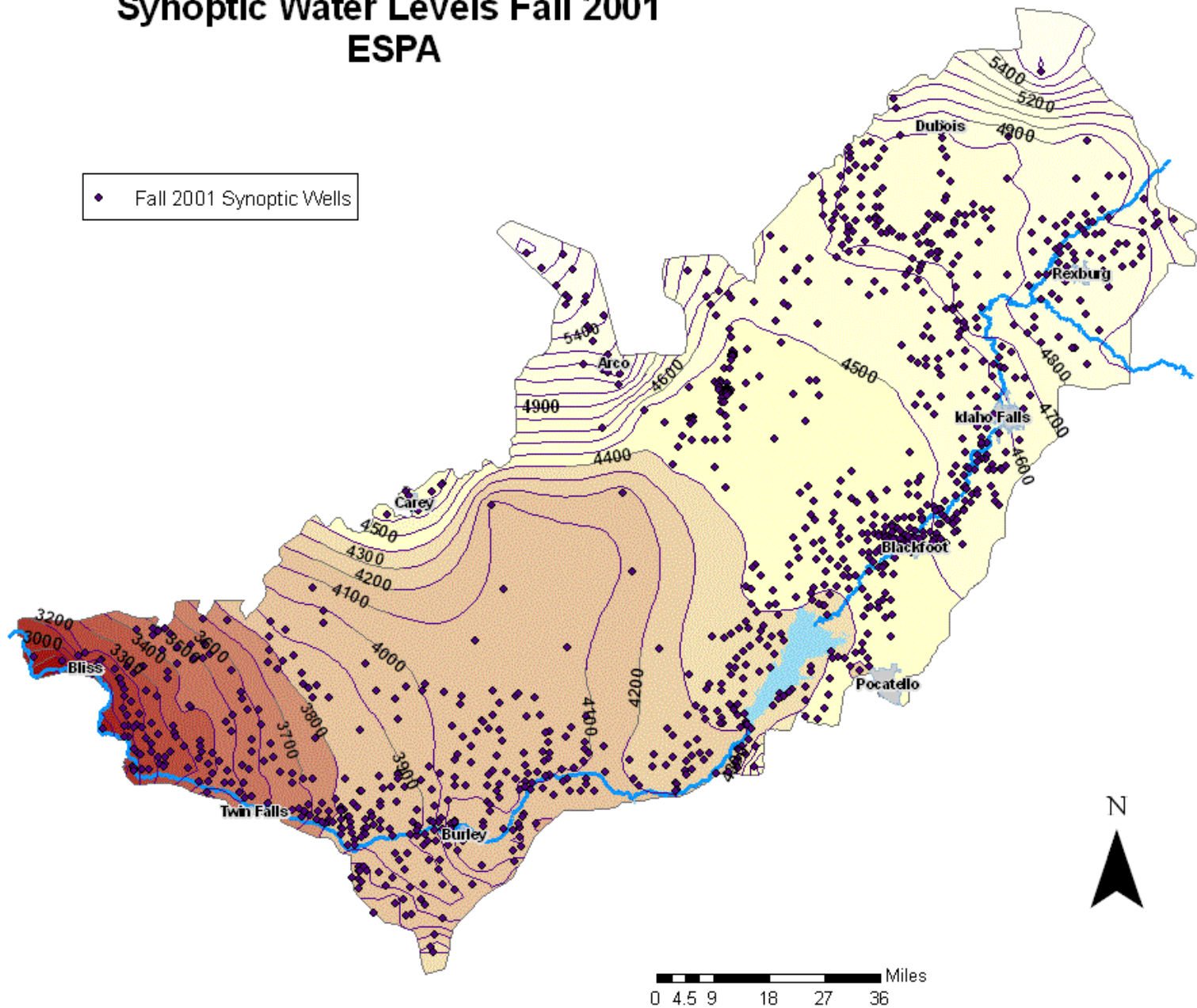


# Synoptic Water Levels Fall 2001 ESPA

Elevation (ft amsl)

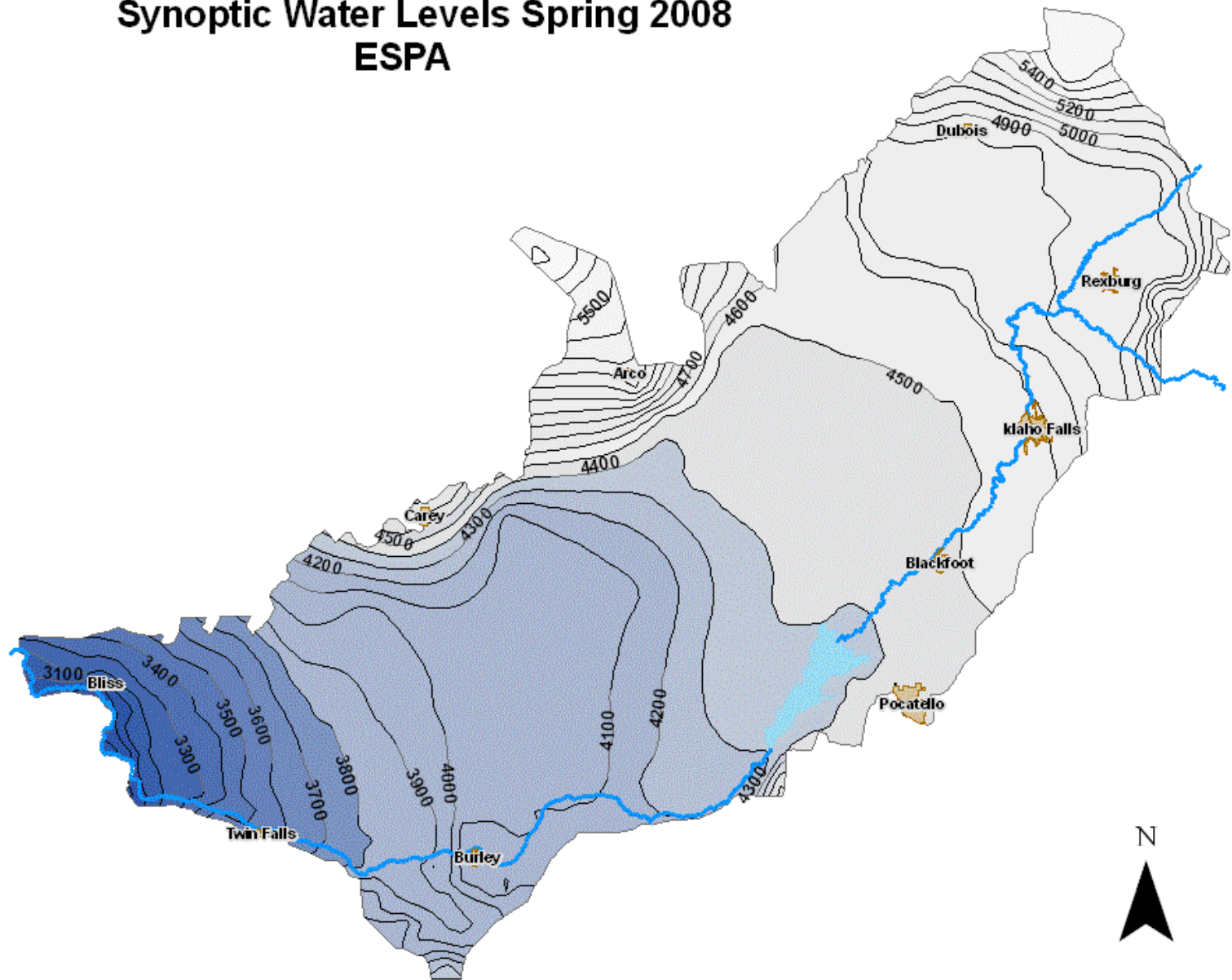
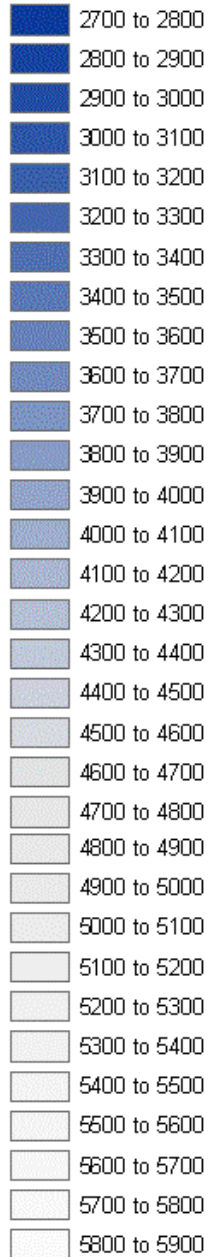


◆ Fall 2001 Synoptic Wells



## Synoptic Water Levels Spring 2008 ESPA

Elevation (ft amsl)

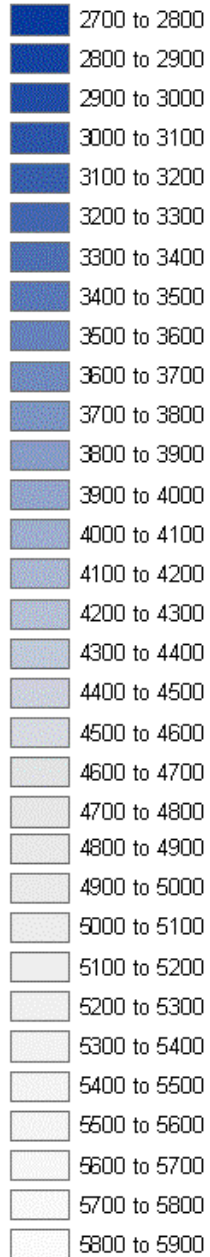


0 4.5 9 18 27 36 Miles

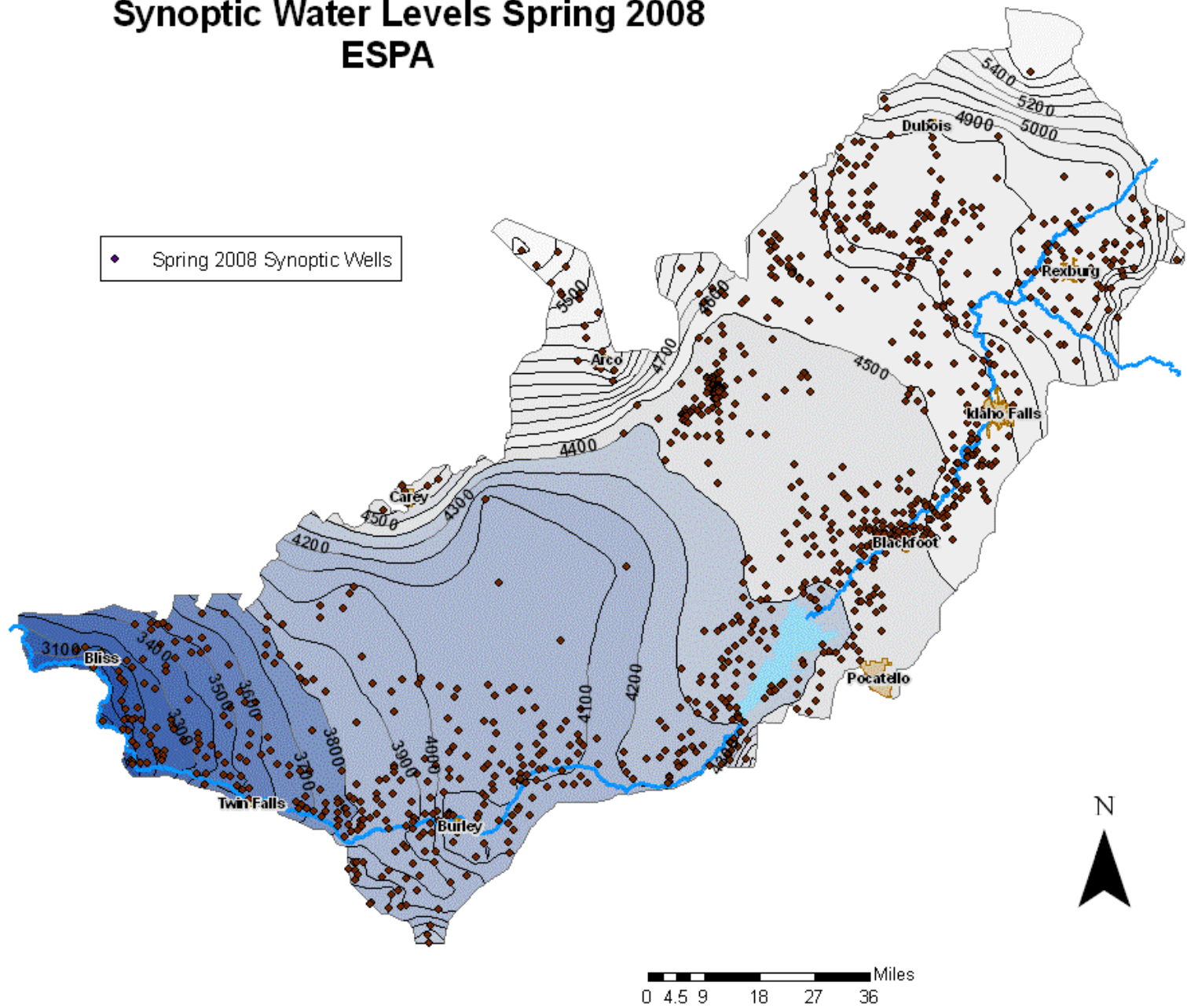


# Synoptic Water Levels Spring 2008 ESPA

Elevation (ft amsl)

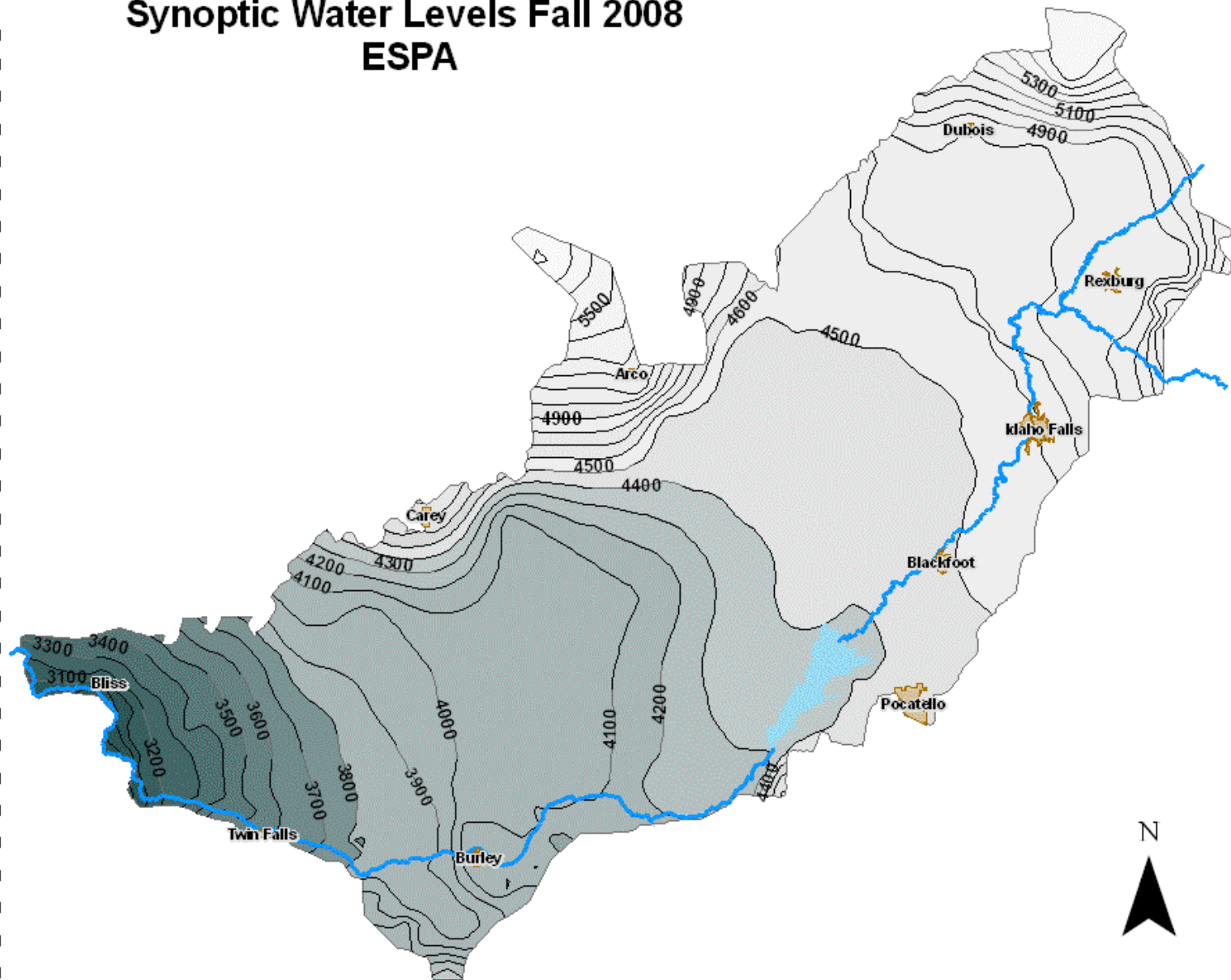


Spring 2008 Synoptic Wells



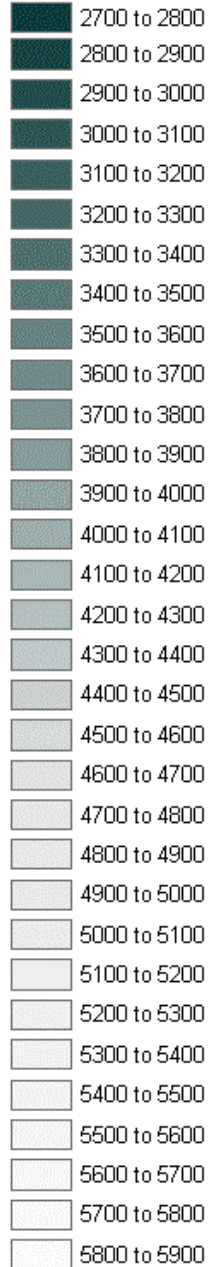
## Synoptic Water Levels Fall 2008 ESPA

Elevation (ft amsl)

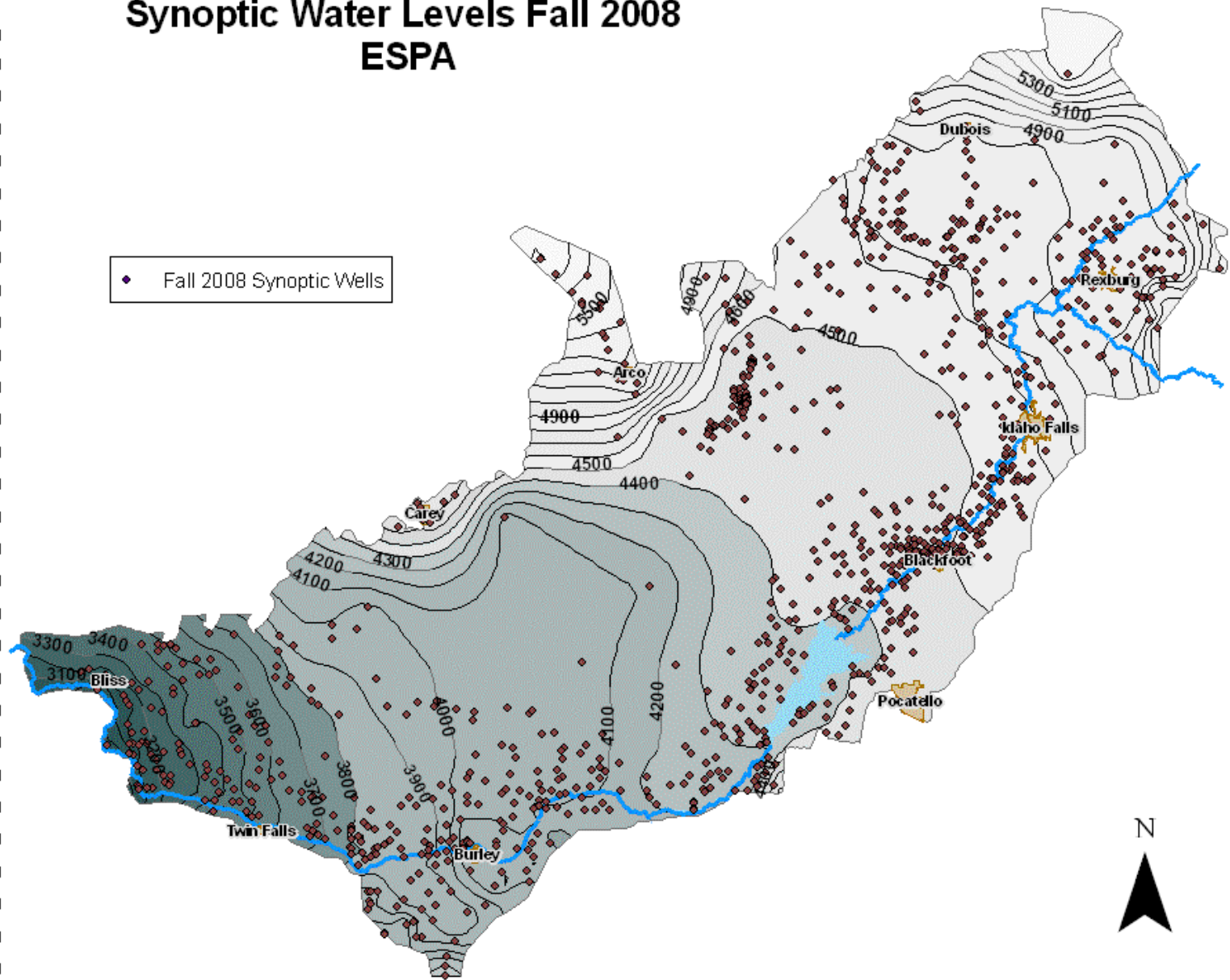


# Synoptic Water Levels Fall 2008 ESPA

Elevation (ft amsl)



♦ Fall 2008 Synoptic Wells

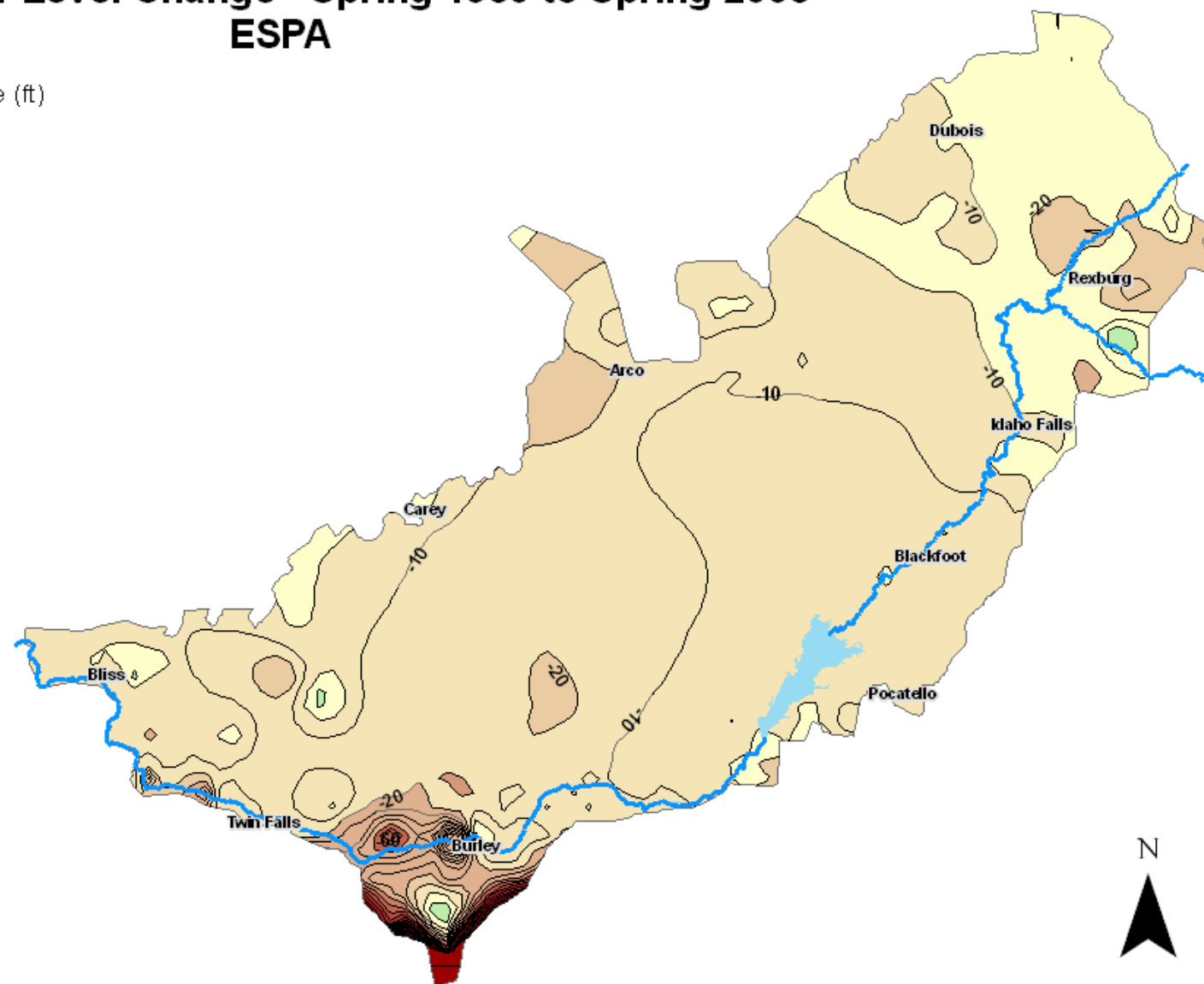
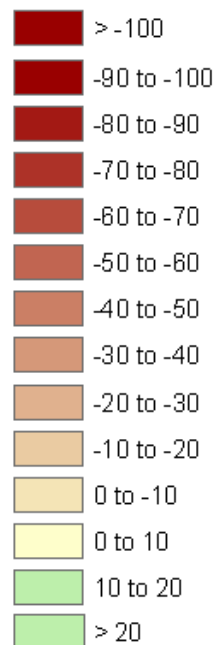


0 4 8 16 24 32 Miles



## Water Level Change - Spring 1980 to Spring 2008 ESPA

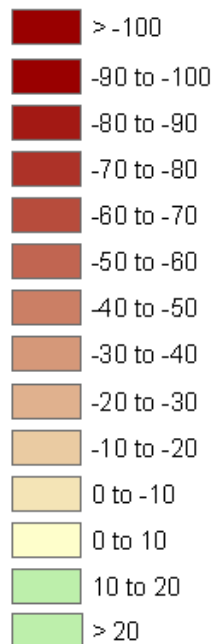
Water Level Change (ft)



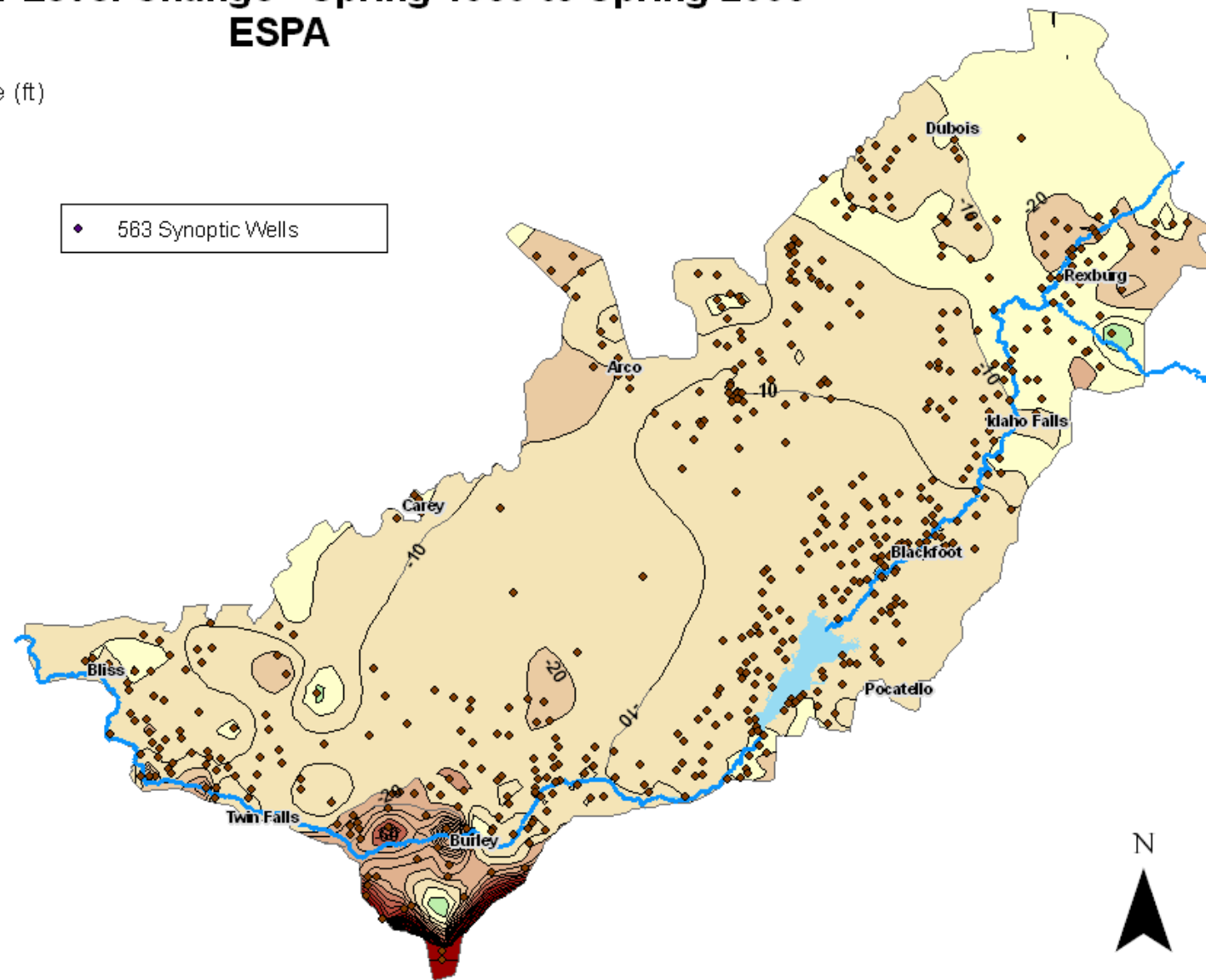


## Water Level Change - Spring 1980 to Spring 2008 ESPA

Water Level Change (ft)



563 Synoptic Wells

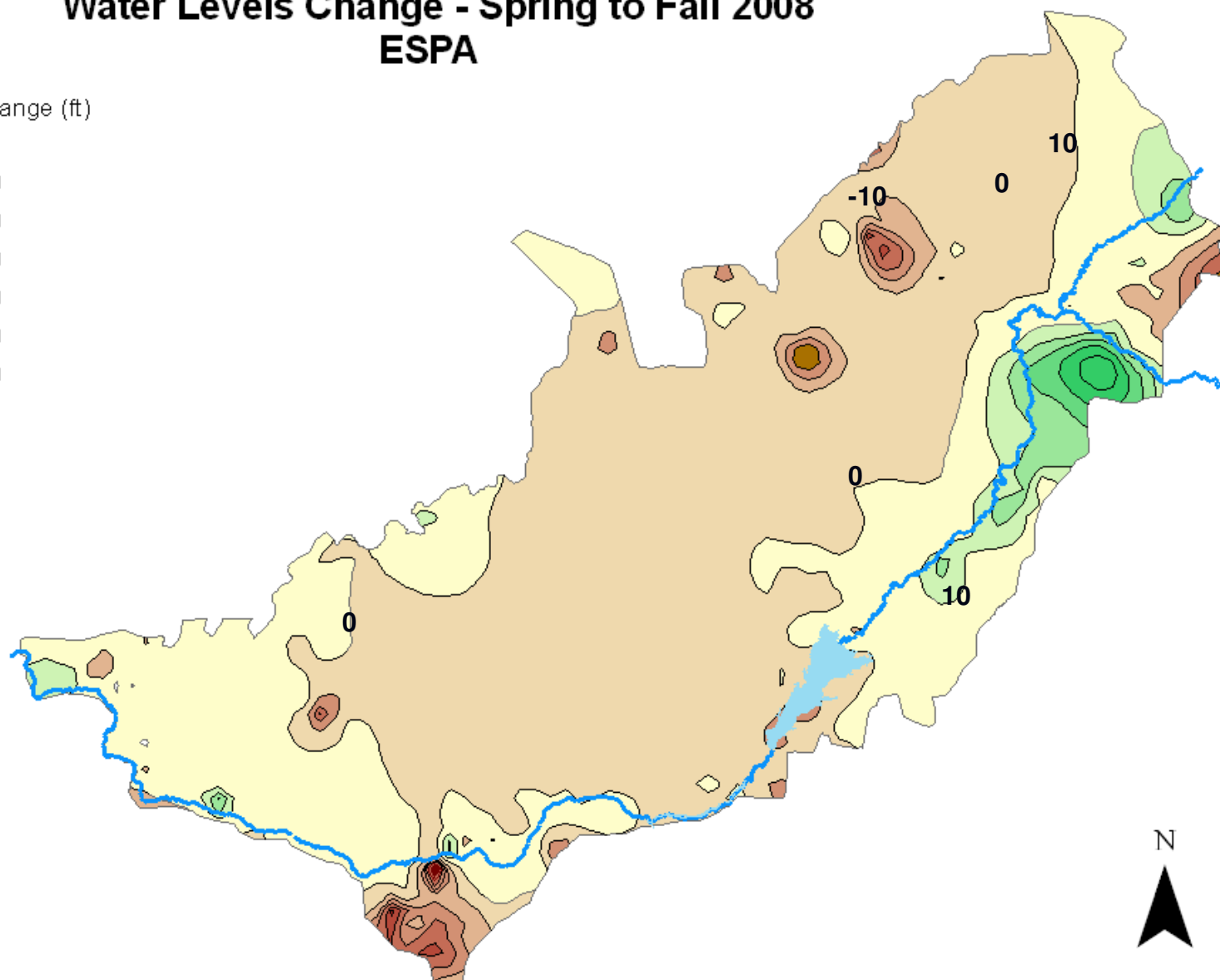
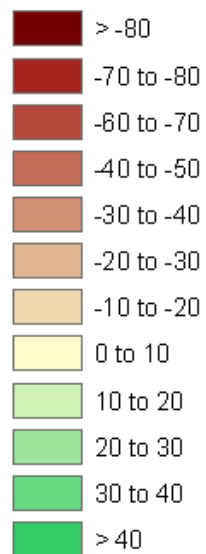


0 4.5 9 18 27 36 Miles



## Water Levels Change - Spring to Fall 2008 ESPA

Water Level Change (ft)



0 4.5 9 18 27 36 Miles

# Work yet undone

- Final QA/QC
  - 2002 synoptic events
  - Check perched
  - Check elevations
  - Finish Figures
  - Update Metadata

# Soliciting Comments

- Synoptic Dates Selection
  - Fixed window (4 weeks, six weeks)
  - Flexible window based on data overlap
- Perched well designation
  - Once perched, always perched?
- Workbook Size

# Thank you

Questions or comments?